CUSHMAN NO. 2 HYDROELECTRIC POWER PLANT, DAM AND SPILLWAY
Spanning the North Fork Skokomish River
Hoodsport Vicinity
Mason County
Washington

HAER No. WA-192-A

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

FIELD NOTES

National Park Service
U.S. Department of the Interior
Pacific West Region
909 First Avenue, Fifth Floor
Seattle, WA 98104

HISTORIC AMERICAN ENGINEERING RECORD

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Location:	Spanning the North Fork Skokomish River, Mason County, Washington USGS Quad – Hoodsport, Washington (Northern Section) USGS Quad – Skokomish Valley, Washington (Southern Section)
UTM Coordinates:	5249369N 484822E
Legal Description:	T22N, R4W. S16
Construction Date:	1930
Engineer/Architect:	Tacoma City Light
Builder:	Tacoma City Light
Present Owner:	City of Tacoma
Historic Use:	Hydroelectric power production
Present Use:	Hydroelectric power production
Significance:	Cushman Hydroelectric Plant No. 2 is significant as an example of state-of-the-art high-head hydroelectric technology from the late 1920s and early 1930s. It is associated with Tacoma's burgeoning industrial and commercial growth, and with projected demands for electric power beyond the capacity of Cushman No. 1 Power Plant, built in 1926. Additionally, Cushman Plant No. 2 includes an architecturally significant powerhouse, designed on a monumental scale in the Neoclassical style. In 1988, Cushman No. 1 and No. 2 Hydroelectric Power Plant Historic Districts were listed in the National Register of Historic Places.
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Report Date:	October 26, 2010

Physical Description

Built in 1930, the Cushman No. 2 Dam is a constant-radius-arch, reinforced-concrete dam spanning a narrow rock gorge. It rises 235 feet above bedrock and has an upstream radius of 135 feet. The dam crescendos from 60 feet long at the base to 450 feet at the crest, creating a dramatic transition between the Lake Kokanee valley and the Skokomish River gorge (Figure 6, Figure 18, Figure 22). The crest of the dam supports a 12.5-foot-wide roadway with a curvilinear, pierced reinforced concrete parapet (Figure 21, Figure 23). The dam is flanked on the east end by a concrete gravity abutment (Figure 19) and at the west end by a 50-foot-high concrete thrust block (Figure 21). The spillway is located at the dam's right side. Lighting atop the dam is provided by contemporary steel standards with steel fixtures and lamps.

J. V. Gongwer, Superintendent of Hydraulic Design and Construction for the project, described the spillway:

> To utilize all available head, maximum water level was fixed at Elevation 480, slightly above ordinary tail water level of the upper plant [Cushman Power Plant No. 1]; and to pass the greatest estimated flood while holding the reservoir level constant at desired operating level, the crest of the spillway was equipped with three 40 x 14 ½' drum gates of U. S. Reclamation Bureau type, with continuous automatic siphon regulation devised by the writer [Gongwer] and first used on this installation The automatic control on these gates more than met expectation in dependability and close regulation, holding the reservoir level within one inch under any condition of flow. The setting for pond level is readily adjustable to any predetermined elevation within a range of six feet.[42]

The 120-foot-wide spillway (Figure 13, Figure 14), which is partially lined with concrete, is located at the dam's west end. The gates are the floating type, hinged along the upstream horizontal axis. The lower portion of the gate floats in a sealed, water-filled chamber. The height of the gate crest is regulated by the water level in this chamber, which is controlled by the siphons. The sluice gate manual controls and the adjustable siphon automatic controls are mounted in the weir structure, which is 155 feet long (Figure 11, Figure 12, Figure 15).[43]

The dam impounds 8,000 acre-feet of used and overflow waters from Cushman No. 1, creating the Lake Kokanee reservoir (Figure 22). For emergency release of water, two steel-lined, eight-foot diameter pipe outlets extend through the base of the dam just above the river bed. Each outlet is fitted with two free-discharge Pelton butterfly valves that work in tandem. The valves were manufactured by the Pelton Water Wheel Company. The outlets are protected on the upstream side by trash racks. J.V. Gongwer, Superintendent of Hydraulic Design and Construction for the project, wrote:

> Only slight precedent existed for the use of butterfly valves in this kind of service, but they have proven highly satisfactory, having been frequently operated for long periods at full head and at various openings without undue vibration. It was found, as expected, that the operation is

[42] J. V. Gongwer. "City of Tacoma Cushman Power Project, Cushman Power Plant No. 2: Final Report of Construction and Cost of Plant" (Tacoma: Department of Public Utilities, October, 1934), 7.
[43] "Cushman Power Plant No. 2 for Tacoma," *Western Construction News,* 538.

> most smooth when the upstream or guard valves are first fully opened and all regulation performed with the downstream valves. When these valves are closed there is absolutely no leakage, and no adjustment of seal rings has been required during nearly 4 years of frequent operation, which is considered remarkable. If necessary, the seals are easily adjustable from the downstream side of the valve."[44] (Figure 7, Figure 8, Figure 20)

The valve controls are located in a control room above the outlets in the 30' 9"-wide concrete cantilevered valve house that projects from the base of the downstream side of the dam. Two 14 x 20" multipane windows with steel sash are on the control room's façade, centered above the outlets. A duplicate window is on the left elevation of the control room. The low-pitched gable roof has always been concrete; in 2008, it was replaced with a new concrete membrane that has not altered the original appearance (Figure 9, Figure 10). At the same time, the original steel staircase, that zigzags from the right side of the top of the dam down its face, to the valve house was rebuilt (Figure 24). In 2008, one of the butterfly valves was removed and replaced by a jet flow gate valve. The alteration, designed to provide in-stream flows, was ordered by both FERC and the Ninth Circuit Court of Appeals as part of the 1998 license for the Cushman Project.

To enable installation of the flow gate valve, reinforced concrete crane pads were constructed on the parapet. The access for cranes also enabled the concrete abutment infill on the steep hill overlooking the spillway (Figure 19). Work to fix two segments of cleft rock began in the 1930s, with installation of an unreinforced concrete cap in the cleft below the spillway. Apron scaffolding was installed in the upstream cleft, as early as the 1940s, to facilitate grouting and drain hole installation. The 2008 infill is in the upstream cleft, where it creates a 116.5-foot-tall concrete buttress.[45]

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[44] Gongwer, "City of Tacoma Cushman Power Project, Cushman Power Plant No. 2: Final Report of Construction and Cost of Plant," 7-8.

[45] Perrin and Miller, "Cushman No. 2 Hydroelectric Development Hoodsport, Mason County, Washington: North Fork Powerhouse and Fish Passage Section 106 Evaluation."